

U. S. Department of Agriculture

Forest Service

APPALACHIAN FOREST EXPERIMENT STATION

Technical Note No. 17

Forest Influences - Watershed Improvement

Asheville, N. C.

November 6, 1935

PLANT INDICATORS OF SOIL CONDITIONS ON RECENTLY ABANDONED FIELDS

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In the reforestation of abandoned farm land no longer used for agriculture, unfavorable growing conditions are indicated by the species of plants present, and familiarity with a few of the most important serves as a guide to the selection of planting methods and tree species most suitable to the site. After the original fertility of the soil has been depleted by continued misuse, applications of commercial fertilizers have permitted further cropping that has resulted in the complete destruction of all organic material of the soil, together with the reduction of favorable soil structure for moisture retention in the upper soil horizons. Frequently sheet erosion has removed much of the surface soil. Such fields when abandoned dry out very rapidly. The lowered capacity of oldfield soil for moisture retention is a major problem in plant establishment.

Moisture and nutrient are indicated by the species of annual plants that first appear. Severity of climatic factors, droughts, freezing and thawing, are indicated by the success or failure of the perennial vegetation to establish itself over the entire field. Local soil types and climatic peculiarities, such as high rainfall, extreme temperatures, strong wind movements, etc., may influence locally the species present and the time required for a given plant succession. For these reasons it is not feasible to try to set up indicators for all the specific conditions likely to be met with in the field. However, the plants listed below by their local names are believed to be among the most significant site indicators met with on oldfields of the Piedmont and lower mountain slopes of the Carolinas, for the first ten years after abandonment. Others may become prominent locally but at least some of the plants mentioned will be found in all localities.

Soil Moisture and Nutrient at a Minimum, Poorest Sites,
Indicated by Pure or Mixed Stands of the Following:

Rough buttonweed (*Diodellea teres*)
Poverty grass (*Aristida dichotoma*)
Bracted plantain (*Plantago aristata*)
Cinquefoil (*Potentilla pumila*)

Horse nettle (*Solanum carolinense*)
Tramp's spurge (*Tithymalopsis corollata*)
Dewberry (*Rubus flagellaris*)
Smilax (*Smilax glauca*)

Soil Moisture and Nutrient Low, Poor Sites,
Indicated by Poorest Site Species Associated with the Following:

ragweed (<i>Ambrosia elatior</i>)	Primrose (<i>Oenothera biennis</i>)
orseweed (<i>Leptilon canadense</i>)	Aster (<i>Aster pilosus</i>)
itterweed (<i>Helenium tenuifolia</i>)	Plantain (<i>Plantago lanceolata</i>)
ield daisy (<i>Leucanthemum leucanthemum</i>)	Japan clover (<i>Lespedeza striata</i>)
ueen Anne's lace (<i>Daucus carota</i>)	Broomsedge (<i>Andropogon scoparius</i> and <i>A. virginicus</i>)

Soil Moisture and Nutrient Fair,
Indicated by Mixed Stands of the Following:

Crabgrass (<i>Syntherisma sanguinale</i>)	Dallis grass (<i>Paspalum pubescens</i>)
Green foxtail (<i>Chaetochloa viridis</i>)	False dandelion (<i>Sitilias caroliniana</i>)
Goldenrod (<i>Solidago altissima</i>)	Japan clover (<i>Lespedeza striata</i>)
Aster (<i>Aster pilosus</i>)	Broomsedge (<i>Andropogon scoparius</i> and <i>A. virginicus</i>)

Soil Moisture and Nutrient Good,
Indicated by Mixed Stands of the Following:

Crabgrass (<i>Syntherisma sanguinale</i>)	Aster (<i>Aster triangularis</i>)
Yard grass (<i>Eleusine indica</i>)	Ironweed (<i>Vernonia glauca</i>)
Lambs quarter (<i>Chenopodium album</i>)	Silver beard (<i>Andropogon ternarius</i>)
Worm seed (<i>Ambrina ambrosioides</i>)	Beard grass (<i>Andropogon glomeratus</i>)
Lobelia (<i>Lobelia spicata</i>)	Panicum grass (<i>Panicum gattingeri</i>)

Plant Succession on Poorest Sites

Very dry and poor soil, subjected to extreme fluctuation in temperature and moisture content throughout the year, and also subjected to frost action in the winter, supports as primary vegetation, an unthrifty growth of rough buttonweed and poverty grass. Bracted plantain also appears as primary vegetation, however the seedlings of this species are unable to become established under severe winter stress or surface soil movement, and the absence of bracted plantain in the primary vegetation emphasizes extensive soil movement. Perennial species of plants may not appear for three years or more and then may be only meagerly represented. The first to appear are yellow cinquefoil, horse nettle, tramp's spurge, dewberry, and smilax. The presence of smilax alone, or of dewberry and smilax, usually indicates a depleted soil that has been subjected to extremely severe drought and erosion for a long period of abandonment.

Sites indicated by the above plants should be planted only to trees that are able to survive the soil conditions of drought and low fertility, such as local yellow pines and black locust. If weed vegetation is very sparse or absent, special efforts should be made to render the soil more stable and improve moisture conditions at the time the trees are planted. This can be done by covering the soil with a mulch of straw, litter, or brush.

Plant Succession on Poor Sites

Oldfield sites that do not dry out so readily as those mentioned above and that are less subjected to other climatic stresses may support at least a scattered cover of perennials within three or more years after cessation of cultivation. The primary vegetation may be composed in part of poverty grass, buttonweed, and bracted plantain, mentioned above, and in fact these species may persist for several years; however, ragweed, horseweed, and bitterweed will also be present. The biennial cover consists of Queen Anne's lace and primrose, the perennial cover of field daisy, plantain, aster, and broomsedge. The perennial cover is always open and interspaced with the poorest site annuals, together with the ragweed and horseweed. The sites indicated by the above plants are suitable for most pines and a few dry site hardwoods.

Plant Succession on Medium Sites

Sites more favorable for plant growth than those above, are indicated by the early appearance of crabgrass and green foxtail. Goldenrod, aster, dallis grass, and false dandelion follow the annuals. The perennial stand may not be completely closed, the interspaces of the perennial cover supporting a mixture of annuals and suppressed perennials. Broomsedge may come into these sites after three or four years. The moisture and fertility conditions of these sites are satisfactory for most trees except hardwoods requiring only the best soils.

Plant Succession on Good Sites

Sites with an adequate supply of soil moisture and nutrients are indicated by lambs quarter, worm seed, and lobelia, together with crabgrass, at least the first year after abandonment. Perennial species such as aster and ironweed are often followed or accompanied by silver beard. Panicum grass may be locally present. Such sites support a mass herbaceous cover from the time of abandonment. They are often so favorable for plant growth that the annual stage is scarcely represented. These areas, although available for trees only as small portions of abandoned farms, will grow trees of high soil moisture and nutrient requirements.